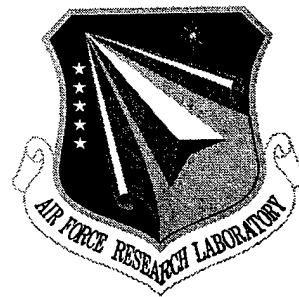AFRL-IF-RS-TR-2001-86
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INTEGRATION AND APPLICATION OF I*3 TECHNOLOGY AND COLLABORATION, VISUALIZATION, AND INFORMATION MANAGEMENT (CVIM) TESTBED

Global InfoTek, Inc.

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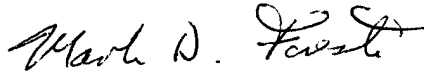
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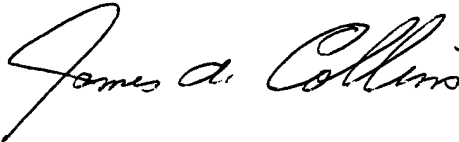
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Ray Emani and
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The intent of the CVIM program was to bridge the gap between a research program and DOD evaluation through development of separate modestly sized integration testbeds. Individual technology efforts of the DARPA Intelligent Integration of Information (I*3), Intelligent Collaboration and Visualization (IC&V), and Information Management (IM) programs were combined and expanded in focus to provide solutions to key problems of interest to the warfighter.

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TABLE OF CONTENTS

Introduction

The Defense Advanced Research Projects Agency's (DARPA) Collaboration, Visualization, and Information Management (CVIM) project has identified promising technologies that have been integrated into several experimental CVIM environments. The feasibility of including these technologies in Defense applications was evaluated.

Key goals of the CVIM project were:

- Developing revolutionary approaches and leading edge technologies for advancing the capability of humans to collaborate on shared problems
- Visualizing collaboration, task, and abstract information spaces,
- Acquiring, Organizing, Retrieving, Correlating, Manipulating and Using networked information resources.

The intent of the CVIM program was to bridge the gap between a research program and DoD evaluation through development of separate, modestly sized integration testbeds. Individual technology efforts of the DARPA Intelligent Integration of Information (I*3), Intelligent Collaboration and Visualization (IC&V), and Information Management (IM) programs were combined and expanded in focus to provide solutions to key problems of interest to the warfighter. Innovative means were employed to evaluate the utility, performance and scalability of promising research results in an integrated and interoperable testbed environment. The results of this effort are reports, a series of prototypes, several integrated testbeds and related demonstrations to the Department of Defense (DoD) community.

In support of the CVIM effort, Global InfoTek (GITI) constructed a series of prototypes, which depended upon the integration of advanced technologies. These prototypes were based on the use of evolutionary development processes and rapid application development tools and technologies. Advanced and innovative capabilities were developed and demonstrated through use of an integration-oriented rather than pure software development-oriented processes. The integration-oriented approach leveraged advanced commercial off the shelf (COTS) products and Government produced advanced applications. The Government produced applications were developed in other DARPA funded activities, including: Advanced Logistics Program (ALP), Human Computer Interfaces (HCI) and Command Post of the Future (CPOF) initiatives. Additional DARPA funded activities, which were beneficiaries of the CVIM efforts, include: Advanced Courses of Action (ACOA), News on Demand (NOD) and Translingual Information Detection, Extraction and Summarization (TIDES).

1 SCOPE

1.1 Integration Architecture and Framework

GITI provided integration guidance in assisting CVIM PIs with developing systems that can be quickly integrated with other research projects such as ALP, HCI and advanced commercial tools. This integration guidance was in tandem and maintained consistency with DARPA ISO's architecture. GITI also reviewed selected PIs implementation strategy and identified requirements for integration and opportunities to produce useful and easy to integrate technology components. In order to minimize the effort required for integrating technology components for end-to-end demonstrations into environments such as CPOF and ALP, GITI (in conjunction with selected CVIM, HCI and ALP PIs) developed a common scenario with supporting data based on typical military operations.

1.2 Testbed Infrastructure and Environment

GITI extended its existing testbed facilities with the inclusion of additional key DARPA and DoD systems, such as GCCS, MCS/P and JMCIS. GITI, in conjunction with DARPA Program Managers, identified and installed component technologies in its testbed facility from I*3, HCI and ALP. These component technologies, installed in GITI's testbed facilities, were made available for integration and use by others. We evaluated, acquired and incorporated Personal Digital Assistants (e.g. Fujitsu Stylistic 1200) and speech recognition technologies to support multimodal user interactions (e.g. BBN's Commander's Dashboard). These components were used to support integration of advanced I*3 and HCI technologies within the CPOF Jumpstart initiative. GITI identified and installed advanced COTS products to augment component technologies and developed plans to evaluate and incorporate additional components.

1.3 Demonstrations

GITI integrated components from other CVIM PIs into the testbed/simulation environment. We performed testing, hardening and integration of these components. We then provided feedback to the CVIM component developers. We specified technical objectives and defined milestones for the CVIM developers to meet DARPA's demonstration objectives. GITI conducted regularly scheduled tests as a means of ensuring compliance with demonstration architecture and timely completion of integration activities.

After completion of integration activities, a series of demonstrations was provided. Prior to each demonstration, a period of time was set aside for scenario rehearsal and testing of the integrated components. The demonstrations took place at GITI's facilities and Government facilities such as the Technology Demonstration Center (TDC) and Technology Integration Center (TIC). These demonstrations were strictly unclassified and utilized unclassified data, workstations and network connections.

1.4 Integrated and Hardened Components

There are three important observations regarding hardening and integration of technology components:

- The technology must be robust enough to withstand unexpected user interactions and requirements.
- Technology providers must have an understanding and appreciation for the functional and operational requirements such that the solutions are presented within a relevant and understood context.
- Working relationships with user communities must exist in order to facilitate the transition of these advanced technologies.

GITI worked with I*3, HCI, IC&V and IM technical PM's to identify selected components. These components were brought into the demonstration testbed and hardened.

1.5 Evaluation of Component Technologies

GITI performed technology product-centric evaluations of component technologies in both pre-integration (e.g. entering the testbed environment) and post-integration (e.g. leaving the testbed environment). GITI performed these evaluations from two perspectives:
- Analysis of software architecture and written code
- Analysis of usability features.

From the software architecture and written code perspective, a multi-factor assessment process was used to evaluate software quality. From the usability perspective, two focus areas were utilized. The first focus area involved usability measures on the technology. The second focus area involved functional/operation processes. GITI tested the human-computer interface of the component technologies at four levels of human-computer interaction (cognitive, semantic, syntactic and psychomotor).

1.6 Command Post of the Future Systems Integration and Demonstration

In supporting the DARPA Program Manager's objectives for the CPOF Jumpstart initiative, GITI performed systems engineering, integration support and demonstration support. The objective of the CPOF Jumpstart initiative was to develop and implement an integration strategy for demonstrating end-to-end user centric advanced multimodal user interfaces, high resolution knowledge visualization, collaborative services and advanced information processing and manipulation technologies in support of the next generation of Command Posts. GITI integrated emerging COTS displays and PDA products, DARPA's HCI technologies and advanced decision support tools to support reasoning and analysis by commanding officers. GITI coordinated the activities of technology providers and convened regularly scheduled technical exchange meetings to ensure timely execution of project activities. GITI scheduled integration tests at its testbed facilities, Government facilities and over the Internet. These integration tests were used to assess early interoperability of components. The results of these integration tests were a series of demonstrations of the CPOF Jumpstart initiative to selected DARPA decision makers and DoD constituency between June 1998 and February 1999.

2 Technical Accomplishments

GITI helped advance the CVIM software environment through the reuse of software component technology from other DARPA sponsored projects. GITI also evaluated both commercial and DARPA-sponsored software component technologies and made recommendations about the use of these technologies for CVIM.

2.1 Early Site Visits

In calendar year 1997, GITI staff traveled to Army Research lab (ARL), Navy Research Lab (NRL), NRAD (predecessor of the current SSC SD), AHPCA (predecessor of the current Technology Integration Center, TIC, facility) and Quantico/ECOC. These facilities were proposed locations for the CPOF Jumpstart demonstrations. As a means of evaluating all the facilities for determining the optimal location for the CPOF Jumpstart demonstrations, a listing of key criteria for each facility was prepared. The criteria evaluated for each of the 5 facilities included the availability of:

- Large Screen Wall Displays (LSWD)
- 3D Sandtables
- Silicon Graphics (SGI) Workstations
- Both Unclassified and Classified Network infrastructures
- Workspaces for integration and demonstration
- Technology components already installed at these facilities
- Ease of access for desired audience, which can include DARPA personnel and members of the Navy, Marines, Army and Air Force
- System classification (either Classified or Unclassified)

After analyzing the criteria for each proposed facility, a recommendation was made to host the CPOF Jumpstart demonstrations at the Technology Integration Environment Facility (or TIEFac, for short). The

4

TIEFac was the predecessor for the current Technology Demonstration Center (TDC). The TDC facility is conveniently located inside DARPA's headquarters in Arlington, Virginia.

2.2 Planning the 1998 Demonstrations

The purposes behind the 1998 CPOF Jumpstart demonstration was to:

- Provide DARPA's management confidence that the program had a firm start, was headed in the right direction, and pursued worthwhile technology
- Present a vehicle to a selected operational community/user base and solicit their feedback on the operational relevance and proper employment of advanced technology in the command post.
- Spur both industry and research communities to perform research and development in areas applicable to the long-term CPOF environment and objectives.
- Provide both a learning and communications vehicle for interaction with various interested communities and an initial basis of a reusable infrastructure for the long-term CPOF program

Based on 1997 site visits and other discussions, the CPOF Jumpstart demonstration was to consist of:

- 25% selected components that were fully integrated into demonstration testbed
- 50% selected components that were partially integrated into demonstration testbed
- 25% mockup using "Wizard of Oz" imagination to creatively bridge gaps between the integrated technology components and the military relevant demonstration scenario.

In addition, four key principles were used in planning the 1998 CPOF Jumpstart demonstrations:

- Establishment of ground rules for demo framework
- Identification of demo location/facility.
- Identification of technical components for demo
- Involvement of all key participants

The following methodology served as a template for the CPOF Jumpstart Demonstration Plan:

- Demonstration Coordination
  - Weekly "all-hands" teleconferences
  - Special issues handled on as as-needed basis
  - Pair-wise integration addressed by appropriate individuals
- Subsystem Development
  - Conducted by individual participants
- Subsystem Integration and Test
  - Check all functionality
  - Includes pair-wise integration and test
  - Install in integration lab as it become stable
- System Integration and Test
  - Check all interfaces
  - Install in demonstration facility for final tests
- Rehearsals
  - Step-by-step walk-throughs of actual demonstration
  - Final technical tests and scenario refinements
- Demonstration
  - VIP demonstration
  - Focus Groups

To support the demonstration methodology, GITI provided team leadership and guidance for the technology component developers in support of the DARPA Program Manager's vision and goals. The demonstration methodology was broken down into four organizational levels:

- DARPA Program Manager
- Scenario and Integration Teams
- Operations and Dialog/Context/Collaboration Teams
- Working Groups
  - Mobile/Remote Information Access
  - Geospatial Visualization/Interaction
  - Decision Centric Visualization
  - Dialog Management and Context Tracking

To facilitate communication between the four organizational levels for the CPOF Jumpstart Demonstration, GITI created the CPOF Jumpstart Systems Engineering web site, which is located on the Internet at cpof.globalinfotek.com. During the demonstration planning, we performed significant expansions, maintenance and updates to the web site. In addition to the web site, GITI created and maintained several group email mailing lists for CPOF Jumpstart demonstration integration, testing and coordination.

2.3 The Hardware and Software Selected for the Demos

2.3.1 Selection of the Synelec Sandtable Large Screen Wall Display

The Synelec sandtable was selected after evaluating a number of alternatives based on cost and technical capability. NRAD offered to provide a sandtable for a cost ranging from $318,000 to $717,000, but a period of 12-18 months (from late 1997) would be required for NRAD to design, construct and test the sandtable. Based on NRAD's proposed solution, the sandtable would have arrived for the CPOF Jumpstart demonstration by late 1998 or early 1999. One of the alternatives, Synelec, cost only $140,000 and could be delivered to the integration facility 6-8 weeks after the order was submitted. Below are some of the technical features of the Synelec:

- Is configured in a 2 x 2 array of Synelec Lite Master 800 DLP display cubes (Each cube is a projector and supports a maximum resolution of 800 x 600)
- Provides a 100" diagonal display surface with 1600 x 1200 pixel resolution
- Provides a single, seamless display surface
- Is driven by Synelec Mosaic 4 x 4 display processor

Based on the low cost and low lead time, the recommendation for purchasing the Synelec sandtable was made in late 1997 and the Synelec sandtable was ordered in spring 1998. The Synelec was delivered and assembled at GITI's integration testbed facility in early August 1998.

2.3.2 Selection of the ITI Digital Desk Large Screen Wall Display

Below are some technical specifications for the ITI Digital Desk large screen wall display:

- The dimensions of the video display is 24"x36", which calculates to a diagonal length of 43"; The desk footprint is 36"x48"
- The video projection is based on a single lens LCD projector.
- The maximum display resolution supported is 1280 x 1024
- Both PC and SGI video interfaces are supported
- The pen based input device emulates native mouse functions on both SGI and PC.
- The cost of a single unit is $55,000

The ITI Digital Desk was ordered on the week of 8 May 1998 and was delivered to GITI in late June of 1998.

2.3.3 Selection of the SMARTBoard Wall Display

To serve as the "Anchor Desk" with the BBN's Commander's Dashboard during the opening sequence of the CPOF Jumpstart demonstration, the recommendation was to obtain a Model 720 SMARTBoard, which provides a maximum resolution of 1024 x 768 and has a diagonal length of 72". To complement this device, GITI purchased an InFocus projector and a Pentium II 233 MHz IBM ThinkPad 770. The SMARTBoard was ordered on the week of 11 May with direct delivery to the TIEFac. The

SMARTBoard and InFocus projector were directly delivered to the TIEFac. The IBM ThinkPad was used as an input source to the SMARTBoard. In early 1999, the TDC integrated the SMARTBoard into their 3 screen wall display.

2.3.4 Acquisition of Other Display Devices

Fort Leavenworth Battle Labs provided two display devices for incorporation in the CPOF Jumpstart integration and demonstration. The two display devices were a Zenith Z systems 21" flat panel touch screen monitor and a 42" Fujitsu flat panel wall display. GITI received these display devices from Fort Leavenworth, assembled the devices, and installed and configured the devices on its workstations.

2.3.5 Acquisition of the two SGI Workstations

Two high-end SGI workstations were provided for the CPOF Jumpstart integration and demonstration effort. The Technology Integration Environment Facility (TIEFac) provided a SGI Onyx workstation to GITI for technology component integration. When the SGI Onyx was delivered to GITI's integration testbed facility, GITI employed SGI engineers who installed additional hard drives, memory and a CD-Rom player. After the upgrades were completed, the SGI Onyx was used to evaluate the visualization software. In addition to the SGI Onyx, GITI obtained a SGI O2 workstation, which was acquired separately, for installing visualization tools such as EDGE.

2.3.6 Installation and Testing of VTC systems

GITI acquired two sets of Video Teleconferencing (VTC) systems and installed these systems on workstations in its integration testbed facility. The first VTC system was the Intel ProShare ISDN based VTC system and this was installed in a Pentium II 333 MHz system. The second VTC system was a Kenwood PCMCIA VTC system for laptop computers. The Kenwood VTC system was installed, configured and tested on the Fujitsu Stylistic ST1200 PDA. The Intel ISDN VTC systems was involved in a VTC test session with Fort Leavenworth prior to the June 1998 rehearsal demonstration, but neither VTC system played a role in the CPOF Jumpstart demonstration.

2.3.7 Selection of Software Components

The selection of the hardware and software components is derived from the four working groups which were defined in the demonstration methodology planning process. For each software component selected, GITI acquired an adequate workstation (low end was Pentium II 233 MHz and high end was Pentium II 400 MHz) that could host the software component without performance issues. The description of the workstation follows the description of the software component selected.

2.3.7.1 Mobile/Remote Information Access

The hardware component selected was the Fujitsu Stylistic ST1200 PDA. The software component selected was BBN's Commander's Dashboard. Commander's Dashboard was installed and configured on the Fujitsu Stylistic ST1200 PDA. The Fujitsu PDA consisted of a Pentium 120 MHz processor with 48 MB of RAM. In addition, Commander's Dashboard was installed and configured on two workstations: a dual processor Pentium II 300 MHz workstation and a Pentium II 233 MHz IBM ThinkPad laptop. The

laptop was connected to the SMARTBoard display device and served as a touch screen display device for multi-modal interactions.

2.3.7.2 Geospatial Visualization/Interaction

The software components selected were Oregon Graduate Institute's Quickset and Army Research Lab's (ARL) BPV/VGIS systems. Quickset was installed and configured on the Fujitsu PDA and the aforementioned dual processor Pentium II 300 MHz workstation. BPV was installed and configured in GITI's integration testbed facility on a SGI O2 system acquired by GITI. VGIS was installed and configured in GITI's integration testbed facility on the SGI Onyx workstation provided by the TIEFac. One of the evaluated visualization systems, EDGE, was not selected because no role could be determined for this technology inside the CPOF Jumpstart demonstration effort.

2.3.7.3 Decision Centric Visualization

The software components selected were the MAYA Group's Visage, Oregon Graduate Institute's Quickset and Army Research Lab's (ARL) BPV/VGIS systems. The Visage application was installed on three Pentium II 400 MHz workstations and the already mentioned dual processor Pentium II 300 MHz workstation.

2.3.7.4 Dialog Management and Context Tracking

The software component selected was TRIPS from the University of Rochester. The TRIPS application was installed on a Sun Ultra-30 workstation with 640 MB of RAM. GITI purchased the Sun Ultra-30 workstation for its integration testbed facility.

2.3.8 "Wizard Of Oz"

As mentioned before, the CPOF Jumpstart demonstration effort utilized "Wizard of Oz" imagery to creatively bridge gaps between the integrated technology components and the military relevant demonstration scenario. GITI acquired and became familiar with Macromedia Shockwave 6.5 technology. To support the CPOF Jumpstart demonstration, GITI used Shockwave to create realistic VTC scenarios from movie clips provided by other technology component PIs. GITI obtained a Pentium-II 333 workstation for Shockwave development and testing. The Shockwave movies were installed on the dual processor Pentium II 300 workstation, three Pentium II 400 MHz workstations and the aforementioned Pentium II 333 MHz workstation.

As part of the software component integration process, GITI recommended to Oregon Graduate Institute (OGI) that OGI develop a "QuickWiz" application to "fake" the QuickSet gestures in case the actual Quickset application failed to interpret the gestures during rehearsal and demonstration phases.

2.3.9 Additional DARPA and DoD Systems Installed in Integration Testbed

2.3.9.1 JMCIS

JMCIS system was delivered to the GITI integration testbed facility and installed and configured on a Hewlett Packard HP 735 system running HP-UX version 9.07

2.3.9.2 MCS/P

MCS/P system was delivered to the GITI integration testbed facility and installed and configured on a Sun Sparc-5 workstation running Solaris 2.4 Operating System.

2.4 The June 1998 IPR demo rehearsals at GITI

Two internal walkthroughs of the CPOF Jumpstart demo occurred in April and May 1998. Prior to June 1998, the demonstration storyboard was being developed. The storyboard was mostly complete by the end of May 1998. With the demonstration storyboard mainly complete and following the delivery, installation and integration of the selected hardware and software components, a 3 day end-to-end rehearsal of the CPOF Jumpstart Demonstration occurred at GITI's integration and testbed facilities. As part of the rehearsal, the following areas were reviewed:

- The accuracy of the demonstration storyboard and the choreography of the component technologies with the military relevant scenario
- The staging of the Demonstration. Assignment of workstations to component technologies. Configuring which workstations were projected to which screens at various points of the Demonstration. Installation and testing mockup video teleconferencing (VTC) system.
- Establishing the roles and responsibilities of GITI staff and other CPOF Jumpstart PIs during the actual demonstration.

Once these functional areas were defined, a series of rehearsal demonstrations were presented to two groups of people during the first two days of the rehearsal. Each group provided feedback on the demonstration aspects and this feedback was incorporated into the demonstration scenario. On the third day of the rehearsal, action items were defined and future technical coordination meetings were planned.

2.5 Activities between the June 1998 IPR rehearsal and September 1998 demos

Following the June 1998 IPR demo, GITI continued testing and hardening the selected hardware and software components. GITI installed a number of patches and upgrades for BBN's Commander's Dashboard application. The SMARTBoard display device was delivered to the TIEFac in August 1998. GITI staff members oversaw the assembly, installation and testing of the SMARTBoard. A major milestone was the finalization of the CPOF Jumpstart demo script in late August 1998. From July 1998 onwards, GITI staff participated in conference calls with the Demonstration Scenario team to finalize the spoken words, human/computer interactions, computer generated alerts and "Wizard of Oz" activities. Once the script was finalized, no further changes were required to support subsequent demos.

2.6 The September 1998 demo to Director of DARPA

On September 2, the CPOF Jumpstart demonstration was presented to the Director of DARPA, Deputy Director of DARPA, key ISO leaders and representatives from various military battle labs. Below is an excerpt from the DARPA Program Manager for CPOF regarding the Director of DARPA's observation of the Jumpstart demo:

> "Everyone in the audience, especially the DARPA director, was very impressed. Your hard work has paid off and clearly established CPOF as an imaginative and truly DARPA-like program. Unfortunately, I think we have 'raised the bar' for what a good DARPA demo should be. We will now see a rash of 'copy cat' demos - but with much poorer acting, no doubt."

After this demonstration, the decision was made to transition the Jumpstart demonstration from GITI's facilities to the TIEFac.

2.7 Transitioning the CPOF Jumpstart demo from GITI's facilities to TIEFac

Following the CPOF Jumpstart demonstration to the Director of DARPA, GITI proceeded to disassemble the hardware and software components used in its integration facility testbed in preparation for moving the CPOF Jumpstart demonstration from GITI's facility to the TIEFac. The CPOF Jumpstart equipment was moved from GITI to the TIEFac on 7 September 1998. For the next week, the equipment was reassembled, configured for the TIEFac network, and connected to the TIEFac audio/visual system. Once the equipment was reassembled within the TIEFac environment, the CPOF Jumpstart demonstration was retested. During the reassembly process at the TIEFac, the Synelec and Digital Desk display devices experienced hardware issues as a result of the moving process. GITI staff spent a lot of time troubleshooting the Synelec and the Digital Desk hardware issues with little or no success. Eventually, GITI brought in Synelec and Digital Desk field engineers to resolve the hardware issues for each respective device. After the equipment issues were resolved, GITI staff became more familiar with disassembling, moving and reassembling the Synelec and Digital Desk. During the reassembly process at the TIEFac, the CPOF Jumpstart software (with installation directions, startup scripts and demonstration procedures) and Macromedia movies were gathered and burned onto CD's for archival and future installations.

2.8 CPOF Jumpstart Demonstrations at the TIEFac

2.8.1 October 1998 demo to Focus Group

In late September / early October, the CPOF Jumpstart demonstration was presented to a selected group of Marines from Quantico. After viewing the demonstration, the Marines were interviewed for their feedback on the demo and potential benefits for future Marine commanders and warfighters.

2.8.2 November 1998 demos to current CPOF contract PI's

The CPOF Jumpstart demonstration was presented to the participants in the current Command Post of the Future contract on November 16-18. Many of the current CPOF contract participants provided positive remarks to the CPOF Program Manager. This demonstration was the climax of the actor reduction initiative with two or three GITI staff and six technology component PIs.

2.8.3 Late November demo to ALP representative, Mr. Lonnie Thacker

Two GITI staff members provided an informal version of the CPOF Jumpstart demo to Mr. Lonnie Thacker of the ALP project.

2.8.4 Late November informal demo to Director of DARPA

Prior to the Thanksgiving holiday, GITI staff members provided a very informal version of the CPOF Jumpstart demo to the Director of DARPA and his family plus the DARPA Program Manager for CPOF.

2.9 February 1999 demos at the TIE Facility

GITI performed a series of demonstrations at the TIE Facility in early 1999.

2.10 Other Technical Accomplishments (Non-CPOF Jumpstart Related)

2.10.1 Developed the COA Plan Animator

GITI developed the Plan Animator software, which is a COA temporal and geospatial visualization tool. This tool was developed in response to the CINCPAC's published requirements for COA visualization. As specified in CINCPAC's requirement, this visualization is from the perspective of METT-T (Mission, enemy, time, terrain, and troops available). This capability enables visualization of complex military plans that require synchronization of different COAs as planned by JFLCC and JFACC. The Plan Animator supports visualization of TPFDD type information as the units are deployed to a theater.

GITI's Java-based Plan Animator provides seamless integration with the Geospatial Force Planning Tool (GFPT), both of which utilize the Lightweight Extensible Information Framework (LEIF) which is a DTAI product.

2.10.2 Developed VSB Plug-Ins

GITI developed several Plug-Ins for the Virtual Situation Book (VSB). These are described in the following sub-sections:

2.10.2.1 Plug-In to integrate LEIF into the VSB

GITI has integrated LEIF into the VSB by developing a plug-in for LEIF. LEIF is a Java-based component for integrating and managing diverse information. The LEIF plug-in allows the VSB to render LEIF objects within a notebook.

2.10.2.2 Campaign Object Server Plug-In

GITI developed a plug-in that allows VSB notebooks to read from and persistently store objects to the Campaign Object Server.

2.10.3 Developed JSDT Collaboration Service

GITI developed a collaboration service based on the Java Shared Data Toolkit (JSDT). JSDT is a Java package that sets up server registries on client machines, which other clients may connect to and join. When a client starts a registry, the client computer searches all known computers that might start a registry, searching for active sessions. The JSDT collaboration service allows users to synchronously share VSB notebooks and notebook objects over a network.

2.10.4 Held a Demonstration for ACOA PM

On 3 March 2000, GITI held a project status review with the ACOA Program Manager, LCDR David Nameroff. During this review, GITI demonstrated the VSB with collaboration and discussed the need for an ACOA collaboration concept of operations. GITI also demonstrated the Plan Animator. LCDR Nameroff suggested several simulation enhancements to the Plan Animator. Several of these suggested enhancements were subsequently incorporated into the Plan Animator.

2.10.5 Installed News on Demand (NOD) at GITI

Installed the Broadcast News Navigator (BNN) NOD capture system at GITI. GITI worked with MITRE and Bolt Beranek and Newman, Inc (BBN) to identify and purchase hardware and software components required to support BNN and NOD. GITI setup and configured a NOD system at its integration laboratory prior to deployment at the TIC.

2.10.6 Integrated NOD with VSB

GITI has developed a NOD plug in for the VSB. This plug in allows digital video (such as MPEG or AVI files) from library archives hyperlinked to web information sources to be inserted as "live objects" into the Virtual Situation Book (VSB), viewed within the VSB and persistently stored. This integration enables VSB users to launch BNN or NOD applications automatically from within the notebook and to

incorporate results of queries against these data sources into the VSB. This capability was used as a critical function in DARPA's TIDES program for building the TIDES Situation Book (TSB).

2.10.7 Deployed BNN and NOD at the TIC

GITI, in collaboration with MITRE, integrated the BNN and NOD components into the Genoa environment. This activity resulted in installation of BNN and NOD at the TIC to provide this capability to all other Genoa team members. GITI, in collaboration with MITRE and BBN, supported required software upgrades and updates as new Genoa system builds were developed.

2.10.8 Integrated the NOD Server

GITI coordinated BNN and NOD technical integration issues during all regularly scheduled Genoa Engineering Review Board meetings and technical exchanges. Recommendations for any architectural or system modifications to BNN and NOD for accommodating unique requirements of Genoa was prepared by GITI for approval by DARPA and implementation by MITRE.

GITI and MITRE developed a CORBA interface from BNN to the Critical Information Package (CIP) server for saving and retrieving of multimedia products. This allows NOD data to be persistently stored on the CIP server. It also allows a deep copy of NOD data to be stored on the CIP server for future access.

2.10.9 Provided BNN/NOD Support

In support of BNN/NOD, GITI upgraded Oracle Database from 8.0.5 to 8.1.5. GITI also upgraded the Oracle Application Server from 4.0.7 to 4.0.8.1. Finally, GITI upgraded the script processing for BNN and for the capture system.

2.10.10 Supported Demonstrations of BNN and NOD technology within GENOA context

GITI coordinated with the Genoa scenario development team to ensure that BNN and NOD features were highlighted at Genoa demonstrations and technology evaluation forums. GITI advocated BNN and NOD to minimize dependence on MITRE's and BBN's resources. GITI showcased key features of the BNN and NOD systems during the Genoa demonstrations. No additional MITRE or BBN resources were needed to support the demonstration activities.

2.10.11 Developed "Generic Launch" for IE5.

GITI developed a "generic launch" plug-in for the TSB to handle the BBN OASIS objects from the TIDES Portal. This capability was developed for the PACTIDES exercise. It allows OASIS objects to be placed in the TSB and launched from within.

3 Significant Meetings Attended

In the course of our work, GITI both hosted and attended several important meetings related to the CPOF Jumpstart integration and demonstration efforts. These are listed here:

- Hosted CPOF Initial Program Review (IPR) Meeting at Hilton Washington Dulles Airport on January 27-29, 1998
- Hosted CPOF Jumpstart IPR Demonstration Rehearsal at GITI on June 1-3, 1998
- Held VIP Demonstrations for DARPA Management, including Director of DARPA at GITI September 1-2, 1998
- Hosted CPOF Demonstration at DARPA TIE September 7-25, 1998
- Conducted Informal Demonstration for DARPA Director November 24, 1998

4 Program Management

GITI has prototyped and presented technical briefings associated with their work herein, and have participated in meetings and technical discussions to increase the knowledge and understanding of the technical advances being researched, prototyped, and demonstrated. GITI has assessed the risk and risk mitigation strategies, and prepared and delivered status and progress reports, including financial status reports as was required.

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